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EXAMINER	
NGUYEN, TOAN D	

ART UNIT	PAPER NUMBER
2616	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/988,940	KENDALL ET AL.	
	Examiner	Art Unit	
	Toan D. Nguyen	2616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 March 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-12,14-18,20-22 and 24-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *18* is/are allowed.

6)☒ Claim(s) *1,3-10,12,14-17,20-22 and 24-36* is/are rejected.

7)☒ Claim(s) *11* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 November 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *6/9/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 1, 3, 6, 8-11, 18, 25, 27, 30, 34 and 35 are objected to because of the following informalities:

in claim 1 line 42, it is suggested to change "to it" to ---said transmission apparatus ---.

In claim 3 line 3, it is suggested to change "Apparatus" to --- The apparatus ---. Similar problem exists in claim 33 line 1, claim 34 line 1, claim 35 line 1, and claim 36 line 1.

In claim 3 line 7, it is suggested to change "one or more serial connections" to --- the one or more serial connections ---. Similar problem exists in claim 11 line 12.

In claim 6 line 42, it is suggested to change "a buffer" to --- the buffer---. Similar problem exists in claim 10 line 6.

In claim 6 line 15 and line 46, it is suggested to change " a receiver" to --- the receiver ---. Similar problems exist in claim 8 line 15 and line 28, and claim 27 line 2.

In claim 9 line 5, it is suggested to change "a the serial data" to --- a serial data ---.

In claim 9 line 8, it is suggested to change "a sequence of arrival of cells" to --- a sequence of arrival of the cells ---.

In claim 10 line 12, it is suggested to change "a remaining capacity" to --- the remaining capacity ---.

In claim 11 line 10, it is suggested to change "for each channel" to --- for each said channel ---.

In claim 18 line 21, it is suggested to change "for each first direction channel" to --- for each of the first direction channel ---.

In claim 18 line 31, it is suggested to change "on different first direction channels" to --- on different the first direction channels ---.

In claim 18 line 47, it is suggested to change "for each second direction channel" to --- for each of the second direction channel ---.

In claim 18 line 56, it is suggested to change "on different second direction channels" to --- on different the second direction channels ---.

In claim 18 line 39, it is suggested to change "an order of arrival of cells" to --- the order of arrival of cells ---. Similar problems exist in claim 18 line 64, and claim 27 line 3.

In claim 25 line 2, it is suggested to change "multiplexing flow control signals" to --- multiplexing the flow control signal ---.

In claim 30 line 10, it is suggested to change "in each channel" to --- in each of the channel ---.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. Claims 6-7, 20-22 and 24-29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 6 recites the limitation "the buffers" in line 39. There is insufficient antecedent basis for this limitation in the claim.

Claim 24 lines 15-21, it is unclear as to what is meant by "upon the transmission of cells in one of the channels being inhibited, waiting until the transmission of cells on the channel is not inhibited and then commencing the transmission of a cell an inter multiple of T after the time at which transmission of a previous cell commenced on the channel." The scope of the claim is, therefore, unascertainable.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 3-5, 6-10 and 33-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Delvaux (US 6,775,305) in view of Castellano et al. (US 5,065,396).

For claims 1 and 36, Delvaux discloses system and method for combining multiple physical layer transport links, comprising:

a first demultiplexer (figure 8, reference 144a) for dividing data of one high-rate data stream into data stream into N sub-streams (figure 8, references 143_0-143_N, col. 16 lines 61-64) so that each sub-stream carries every N^{th} cell of the one high-rate data stream (figure 11, reference step 212, col. 20 lines 18-20), the first demultiplexer (figure 8, reference 144a) configured to stagger transmission of cells in the sub-stream in time with respect to one another (figure 9, reference line 0 and line 1, col. 18 lines 53-65);

for each of the N sub-stream (figure 8, references 143_0-143_N), a data transmitting device (figure 8, reference 143) for serializing the data from the sub-stream and transmitting the serialized data connections over said mid-plane (figure 8, reference 146) to a data receive interface (figure 8, reference 145)(col. 18 lines 28-30).

Delvaux disclose further whereby cell integrity and sequencing is maintained at said data transmission apparatus (figure 8, reference 143).

and each of said sub-stream carries the cells that are routed to it by the first demultiplexer (figure 8, reference 144a) at a rate that is N times lower than a data rate of the high-rate data stream.

However, Delvaux does not expressly disclose:

a first transmit control circuit connected to the data transmitting devices of the N sub-streams and configured to insert flow control signals into one or more of the sub-stream, the first transmit control circuit configured to selectively enable and disable the data transmitting device in response to first receiver enable signals received over said mid-plane from the data receive interface, and each of said sub-stream carries the cells that are routed to it by the first demultiplexer at a rate that is N times lower than a data rate of the high-rate data stream.

In an analogous art, Castellano et al. disclose:

a first transmit control circuit (figure 6, reference SYNCH 12_4) connected to the data transmitting devices of the N sub-streams (figure 1, references PMUX 13_1 - PMUX 13_4), and configured to insert flow control signals (figure 6, reference MARKER INSERT 41) into one or more of the sub-stream , the first transmit control circuit (figure 5,

reference SYNCH 12_4) configured to selectively enable and disable the data transmitting device in response to first receiver enable signals received over from the data receive interface (figure 1, references PMUX 23_1 - PMUX 23_4) (col. 3 lines 63-68), and each of said sub-stream carries the cells that are routed to it by the first demultiplexer (figure 1, reference 11) at a rate that is N times lower than a data rate of the high-rate data stream (col. 3 lines 14-18).

Castellano et al. disclose wherein the flow control signals includes a clock signal, a parity signal, and a start of cell signal (figure 6, col. 3 line 68 to col. 4 line 5 as set forth in claim 36).

One skilled in the art would have recognized the first transmit control circuit, and would have applied Castellano et al.'s synchronization in Delvaux's multi-channel communication link. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to use Castellano et al.'s inverse multiplexer and demultiplexer techniques in Delvaux's system and method for combining multiple physical layer transport links with the motivation being to provide a separate synchronizer for each subsectional output signal from demultiplexer 11 (col. 3 lines 42-44).

For claims 3-5, 33 and 34, Delvaux discloses:

a plurality of data receive devices (figure 8, reference 145, col. 16 lines 17-18) each connected to receive a sub-stream of data comprising data incoming on one or more serial connections provided by the mid-plane (col. 18 lines 28-30).

However, Delvaux does not expressly disclose:

for each of the data receive devices, a corresponding buffer configured to receive fixed-length data cells carried in the corresponding sub-stream, and

a first receive control circuit configured to determine a sequence of arrival of the cells and to place the cells onto a bus in the sequence of arrival.

In an analogous art, Castellano et al. disclose:

for each of the data receive devices (figure 7 , reference RESYNCH 24), a corresponding buffer (figure 7, reference HIGH SPEED RAM) configured to receive fixed-length data cells carried in the corresponding sub-stream (col. 9 lines 8-16), and

a first receive control circuit (figure 7, reference RESYNCH 24) configured to determine a sequence of arrival of the cells (col. 9 lines 20-65).

Castellano et al. disclose the first receive control circuit (figure 7, reference RESYNCH 24) is configured to provide flow control signals to the first transmit control circuit (figure 6, reference SYNCH 12) and the first transmit control circuit is configured to inhibit the output of cells by one or more of the data transmit devices in response to the received flow control signals (col. 9 lines 8-65 as set forth in claim 4); wherein the first receive control circuit is configured to demultiplex the flow control signals from the corresponding sub-stream (col. 9 lines 8-65 as set forth in claim 5); for altering a status of second receiver enable signals corresponding to each of the data receive devices based on a status of the corresponding buffer (col. 9 lines 14-65 as set forth in claim 33), mechanism for generating a second receive enable signal upon the arrival in one of the buffers of a second last cell that the buffer can hold (col. 9 lines 14-65 as set forth in claim 34).

One skilled in the art would have recognized the for each of the data receive devices, a corresponding buffer configured to receive fixed-length data cells carried in the corresponding sub-stream, and would have applied Castellano et al.'s resynchronization in Delvaux's multi-channel communication link. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to use Castellano et al.'s inverse multiplexer and demultiplexer techniques in Delvaux's system and method for combining multiple physical layer transport links with the motivation being to provide a separate synchronizer for each PMUXs (col. 9 lines 8-11).

For claim 6, Delvaux discloses system and method for combining multiple physical layer transport links, comprising:

a first demultiplexer (figure 8, reference 144a, col. 16 lines 14-15) connected to receive the data stream and to split the data stream by delivering the cells in rotation into a plurality of N transmit channels (figure 8, references 143_0-143_N, col. 16 lines 61-64) so that each transmit channel carries every N^{th} cell (col. 2 lines 42-45),

for each said transmit channel a data transmitting device (figure 8, reference 143) connected to receive the cells of the transmit channel (figure 8, reference 146) and to output the cells on one or more data connections (figure 8, reference 146) carrying data in a first direction to a receiver, wherein the data transmitting device comprises a serializer device and the data connections comprise serial data connections (figure 8, reference 144b) (col. 16 line 61 to col. 17 line 3, and col. 18 lines 28-30);

the apparatus comprising:

a first receive interface (figure 8, reference 145) for receiving a data stream (col. 17 lines 25-28), the first receive interface comprising:

a plurality of deserializer devices for receiving one or more serial streams of cells in each of a plurality of receive channels (col. 17 lines 25-28).

However, Delvaux does not expressly disclose:

a first transmit control circuit connected to the data transmitting devices, the first transmit control circuit configured to cause the transmitting devices to output the cells in sequence with the commencement of transmission of cells on sequential transmit channels staggered in time relative to one another by a time difference ΔT; and

a first receive control circuit configured to determine a sequence of arrival of the cells and to place the cells onto a bus in the sequence of arrival; and

wherein the first receive interface comprises a buffer associated with each of the deserializer devices, each of the buffers of a capacity sufficient to hold a plurality of cells, wherein the receive control circuit is configured to issue a flow control signal when a buffer has a remaining capacity of Q cells, with $Q \geq 1$ and the first transmit control circuit is configured to transmit the flow control signal with the serial data to a second receive interface at a receiver.

In an analogous art, Castellano et al. disclose:

a first transmit control circuit (figure 6, reference SYNCH 12_4) connected to the data transmitting devices, the transmit control circuit (figure 6, reference SYNCH 12_4) configured to cause the transmitting devices to output the cells in sequence with the

commencement of transmission of cells on sequential transmit channels staggered in time relative to one another by a time difference ΔT (col. 4 lines 8-14);

a first receive control circuit (figure 7, reference 24_4) configured to determine a sequence of arrival of the cells and to place the cells onto a bus in the sequence of arrival col. 9 lines 20-65); and

wherein the first receive interface comprises a buffer (figure 7, reference HIGH SPEED RAM) associated with each of the deserializer devices, each of the buffers of a capacity sufficient to hold a plurality of cells, wherein the receive control circuit (figure 7, reference 24_4) is configured to issue a flow control signal when a buffer has a remaining capacity of Q cells, with $Q \geq 1$ and the first transmit control circuit (figure 6, reference SYNCH 12_4) is configured to transmit the flow control signal with the serial data to a second receive interface at a receiver (col. 9 lines 11-65).

One skilled in the art would have recognized the first transmit control circuit, and would have applied Castellano et al.'s synchronization in Delvaux's multi-channel communication link. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to use Castellano et al.'s inverse multiplexer and demultiplexer techniques in Delvaux's system and method for combining multiple physical layer transport links with the motivation being to provide a separate synchronizer for each subsectional output signal from demultiplexer 11 (col. 3 lines 42-44).

For claim 7, Delvaux in view of Khotimsky et al. discloses wherein the first transmit control circuit is configured to multiplex the flow control signal with the serial data in one of the transmit channels (col. 16 lines 62-64).

For claims 8 and 10, Delvaux discloses system and method for combining multiple physical layer transport links, comprising:

a first demultiplexer (figure 8, reference 144a, col. 16 lines 14-15) connected to receive the data stream and to split the data stream by delivering the cells in rotation into a plurality of N transmit channels (figure 8, references 143_0-143_N, col. 16 lines 61-64) so that each transmit channel carries every N^{th} cell (col. 2 lines 42-45),

for each said transmit channel a data transmitting device (figure 8, reference 143) connected to receive the cells of the transmit channel (figure 8, reference 146) and to output the cells on one or more data connections (figure 8, reference 146) carrying data in a first direction to a receiver, wherein the data transmitting device comprises a serializer device and the data connections comprise serial data connections (figure 8, reference 144b)(col. 16 line 61 to col. 17 line 3, and col. 18 lines 28-30); and

wherein the first transmit interface is located on a line card (figure 8, reference 143) having an interface for receiving the data stream, the apparatus comprises a receiver on a second card (figure 8, reference 145), and the serial data connections comprise data lines extending between the line card and the second line card through a midplane (figure 8, reference 146) (col. 16 lines 62-64 and col. 18 lines 28-30).

However, Delvaux does not expressly disclose:

a first transmit control circuit connected to the data transmitting devices, the first transmit control circuit configured to cause the transmitting devices to output the cells in sequence with the commencement of transmission of cells on sequential transmit channels staggered in time relative to one another by a time difference ΔT.

In an analogous art, Castellano et al. disclose:

a first transmit control circuit (figure 6, reference SYNCH 12_4) connected to the data transmitting devices of the N sub-streams (figure 1, references PMUX 13_1 - PMUX 13_4), and configured to insert flow control signals (figure 6, reference MARKER INSERT 41) into one or more of the sub-stream , the first transmit control circuit (figure 5, reference SYNCH 12_4) configured to selectively enable and disable the data transmitting device in response to first receiver enable signals received over from the data receive interface (figure 1, references PMUX 23_1 - PMUX 23_4) (col. 3 lines 63-68).

Castellano et al. disclose further wherein the second receive interface comprises a buffer (figure 8, reference HIGH SPEED RAM) associated with each of the deserializer devices, each buffer of a capacity sufficient to hold a plurality of cells, wherein the second receive control circuit is configured to issue a flow control signal when a buffer has a remaining capacity of Q cells or fewer, with $Q \gg 1$, the second card comprises a transmitter connected to transmit the flow control signal to the line card and the first transmit control circuit is configured to inhibit transmission of cells on at least a channel corresponding to the buffer which has a remaining capacity of Q cells or fewer in response to the flow control signal (col. 9 lines 20-65 as set forth in claim 10).

One skilled in the art would have recognized the first transmit control circuit, and would have applied Castellano et al.'s synchronization in Delvaux's multi-channel communication link. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to use Castellano et al.'s inverse multiplexer and demultiplexer techniques in Delvaux's system and method for combining multiple physical layer transport links with the motivation being to provide a separate synchronizer for each subsectional output signal from demultiplexer 11 (col. 3 lines 42-44).

For claim 9, Delvaux discloses:

a). a plurality of deserializer devices for receiving a the serial data in each of the channels (col. 17 lines 25-31).

However, Delvaux does not expressly disclose:

b) a second receive control circuit configured to determine a sequence of arrival of cells in the serial data and to place the cells onto a bus in the sequence of arrival. In an analogous art, Castellano et al. disclose a second receive control circuit configured to determine a sequence of arrival of cells in the serial data and to place the cells onto a bus in the sequence of arrival (figure 7, reference RESYNCH 24_1 - RESYNCH 24_4) (col. 9 lines 20-27).

One skilled in the art would have recognized the second receive control circuit, and would have applied Castellano et al.'s resynchronization in Delvaux's multi-channel communication link. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to use Castellano et al.'s inverse multiplexer and

demultiplexer techniques in Delvaux's system and method for combining multiple physical layer transport links with the motivation being to provide a separate resynchronizer for each PMUXs (col. 9 lines 8-11).

For claim 35, Delvaux discloses wherein the sub-streams are staggered in time byΔT, andΔT is greater than a maximum total skew due to the mid-plane, the data transmitting device and the data receive interface (col. 19 lines 10-15).

5. Claims 12, 14-17 and 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Delvaux (US 6,775,305) in view of Khotimsky et al. (US 6,788,686).

For claim 12, Delvaux discloses system and method for combining multiple physical layer transport links, comprising:

a) means for carrying a data stream comprising a sequence of cells having an order (figure 8, col. 16 lines 37-60);

b) demultiplexing means (figure 8, reference 144a) for assigning each of the cells of the data stream to one of a plurality of channels (figure 8, reference 143) (col. 16 line 61 to col. 17 line 3);

c) transmitting means for transmitting the cells in each channel to a receiver by way of signal conductors in a mid-plane (figure 8, reference 146) (figure 8, reference 144b) (col. 17 lines 25-28 and col. 18 lines 28-29);

e) receiving the cells in the order at the receiver (col. 17 lines 25-31).

Delvaux further discloses:

d) commencing the transmission of individual cells to the receiver, in the order, at times staggered relative to one another by a time differenceΔT that exceeds a worst

case interchannel difference in latency for transmission of cells from the transmitting means to the receiver (col. 19 lines 10-15).

However, Delvaux does not expressly disclose control means for commencing the transmission of individual cells to the receiver. In an analogous art, Khotimsky et al. disclose control means (figure 3, reference 40) for commencing the transmission of individual cells to the receiver (col. 7 lines 5-6 and col. 7 line 62 to col. 8 line 64).

One skilled in the art would have recognized the control means, and would have applied Khotimsky et al.'s control circuit in Delvaux's multi-channel communication link. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to use Khotimsky et al.'s method of maintaining packet order multipath transmission system having non-uniform traffic splitting in Delvaux's system and method for combining multiple physical layer transport links with the motivation being to provide a controller acts as an inverse multiplexor (demultiplexor) with respect to the inbound split traffic streams and as a resequencer (or multiplexor) with respect to the outbound streams (col. 4 lines 4-6).

For claim 14, Delvaux discloses means for receiving a plurality of serially transmitted cells in a plurality of channels and means for determining an order of arrival of the plurality of cells (figure 8, col. 16 line 49 to col. 17 line 28).

For claims 15-17, Delvaux discloses a first receive interface for receiving a data stream, the first receive interface comprising a plurality of receiving devices each for receiving a stream of cells in one of a plurality of channels (figure 8, col. 16 line 49 to col. 17 line 28).

However, Delvaux does not expressly disclose a first receive control circuit configured to determine a sequence of arrival of the cells and to place the cells onto a bus in the sequence of arrival. In an analogous art, Khotimsky et al. disclose a first receive control circuit configured to determine a sequence of arrival of the cells and to place the cells onto a bus in the sequence of arrival (col. 4 lines 2-6 and col. 6 lines 26-33).

Khotimsky et al. disclose wherein the first receive interface is adapted to receive in the data stream a first direction flow control signal and the first transmit control circuit is connected to receive the flow control signal and adapted to selectively enable or inhibit the transmission of cells by one of the data transmission devices in response to the flow control signal (col. 6 lines 26-33 as set forth in claim 16); and wherein the first receive interface is adapted to generate a second direction flow control signal and the first transmit control circuit is adapted to cause one of the data transmitting devices to output the second direction flow control signal (col. 7 line 62 to col. 8 line 7 as set forth in claim 17).

One skilled in the art would have recognized the first receive control circuit, and would have applied Khotimsky et al.'s a first receive control circuit in Delvaux's multi-channel communication link. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to use Khotimsky et al.'s method of maintaining packet order multipath transmission system having non-uniform traffic splitting in Delvaux's system and method for combining multiple physical layer transport links with the motivation being to provide a controller acts as an inverse multiplexor

(demultiplexor) with respect to the inbound split traffic streams and as a resequencer (or multiplexor) with respect to the outbound streams (col. 4 lines 4-6).

For claim 30, Delvaux discloses system and method for combining multiple physical layer transport links, comprising:

assigning each of the cells to one of a plurality of channels (figure 8, reference 143), each of the channels having a recurring cell transmit time (col. 16 lines 52-64);

in each channel (figure 8, reference 143), transmitting the cells in sequence to the receiving device over one or more serial data connections (figure 8, reference 145) and commencing transmission of each cell only at the cell transmit time for that channel (col. 17 lines 9-31 and col. 18 lines 28-30); and

receiving the transmitted cells at a receiving device in the same order that the cells were transmitted (col. 17 lines 25-31).

However, Delvaux does not expressly disclose the cell transmit times for successive channels staggered relative to one another by amounts exceeding any inter-channel differences in skew and latency. In an analogous art, Khotimsky et al. disclose the cell transmit times for successive channels staggered relative to one another by amounts exceeding any inter-channel differences in skew and latency (col. 2 lines 8-14).

One skilled in the art would have recognized the cell transmit times for successive channels staggered relative to one another by amounts exceeding any inter-channel differences in skew and latency, and would have applied Khotimsky et al.'s re-assembly engine in Delvaux's multi-channel communication link. Therefore, it

would have been obvious to one of ordinary skill in the art at the time of the invention, to use Khotimsky et al.'s method of maintaining packet order multipath transmission system having non-uniform traffic splitting in Delvaux's system and method for combining multiple physical layer transport links with the motivation being to provide a re-assembly engine at the receiving end, and the re-assembly engine be able to buffer each channel's data to allow for correct reconstruction of the aggregate flow (col. 2 lines 12-14).

For claim 31, Delvaux discloses deserializing the transmitted cells at the receiving device, and detecting an order of arrival of the cells at the receiving device (col. 17 lines 25-31).

For claim 32, Delvaux discloses receiving a plurality of cells substantially simultaneously at the transmitting device and assigning each of the plurality of cells to one of the plurality of channels in rotation (col. 2 lines 42-45).

6. Claim 20-22, 24-25, 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Delvaux (US 6,775,305) in view of Khotimsky et al. (US 6,788,686) further in view of Jordan (US 2003/0016697).

As far as understood with respect to claims 24 and 29, Delvaux discloses system and method for combining multiple physical layer transport links, comprising:

assigning consecutive cells of the data stream into different ones of a plurality of channels (figure 8, reference 146) (col. 16 line 61 to col. 17 line 8); and

upon the transmission of cells in one of the channels being inoperative (inhibited means) (figure 11, reference step 214, col. 20 lines 27-28), and then commencing the

transmission of a cell an integer multiple of ΔT after the time at which transmission of a pervious cell commenced on the channel (figure 11, reference 220, col. 20 lines 28-30).

However, Delvaux does not expressly disclose:

simultaneously transmitting to the receiver data on each of the channels while staggering transmission of consecutive ones of the cells in time relative to one another by a time differenceΔT; and

receiving a flow control signal and inhibiting the transmission of cells in at least one of the channels in response to the flow control signal; and

waiting until the transmission of cells on the channel is not inhibited.

In an analogous art, Khotimsky et al. disclose:

simultaneously transmitting to the receiver data on each of the channels (figure 4, references P0-P3) while staggering transmission of consecutive ones of the cells in time relative to one another by a time differenceΔT (col. 6 lines 26-30 and col. 7 lines 5-6); and

receiving a flow control signal and inhibiting the transmission of cells in at least one of the channels in response to the flow control signal (col. 7 lines 62-64); and

One skilled in the art would have recognized the simultaneously transmitting to the receiver data on each of the channels while staggering transmission of consecutive ones of the cells in time relative to one another by a time differenceΔT, and would have applied Khotimsky et al.'s control circuit in Delvaux's multi-channel communication link. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to use Khotimsky et al.'s method of maintaining packet order multipath

transmission system having non-uniform traffic splitting in Delvaux's system and method for combining multiple physical layer transport links with the motivation being to perform end-to-end connection splitting on cell-by-cell basis (col. 7 lines 4-5).

Furthermore, Delvaux in view of Khotimsky et al. does not expressly disclose the transmission of cells on the channel is not inhibited. In an analogous art, Jordan discloses the transmission of cells on the channel is not inhibited (page 4, paragraph [0035] lines 15-18).

Jordan discloses wherein suspending transmission of cells on the channel comprises issuing a flow control signal (figure 1, reference 120, page 4 paragraph [0041] line 14 as set forth in claim 29).

One skilled in the art would have recognized the transmission of cells on the channel is not inhibited, and would have applied Jordan's priority channel in Delvaux's multi-channel communication link. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to use Jordan's method and apparatus for converting data packets between a higher bandwidth network and a lower bandwidth network having multiple channels in Delvaux's system and method for combining multiple physical layer transport links with the motivation being to divert capacity on the secondary channel from the low priority to the high priority data without loss of any high-priority data with the low priority data then currently utilizing the lower priority channel being subject to delay and/or data loss (page 4, paragraph [0035] lines 17-21).

For claims 20 and 27, Delvaux discloses comprising serializing the data of each channel before transmitting the data of the channel (figure 8, reference 143) (col. 16 line 61 to col. 17 line 3).

For claim 21, Delvaux discloses wherein there are N channels and assigning each of the cells of the data stream into one of a plurality of channels comprises assigning the cells to the channels in rotation so that each channel carries every Nth cell (col. 2 lines 42-45).

For claim 22, Delvaux discloses wherein transmitting the serialized data for each channel comprises transmitting a plurality of streams of serial data (figure 8, col. 16 lines 49-64).

For claim 25, Delvaux discloses for at least one channel, multiplexing flow control signals with the serialized data before transmitting the serialized data (figure 8, col. 16 lines 61-64).

For claim 28, Delvaux discloses for each channel, monitoring a number of cells which have arrived at the receiver and have not yet been placed on the signal bus and suspending transmission of cells on the channel if the number exceeds a threshold (col. 20 lines 30-32).

7. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Delvaux (US 6,775,305) in view of Khotimsky et al. (US 6,788,686) and Jordan (US 2003/0016697) further in view of McKeown et al. (US 6,647,019).

For claim 26, Delvaux in view of Khotimsky et al. and Jordan does not expressly disclose wherein the sequence of cells comprises an OC-192 data stream. In an

analogous art, McKeown et al. disclose wherein the sequence of cells comprises an OC-192 data stream (col. 8 lines 66-67).

One skilled in the art would have recognized the OC-192 data stream, and would have applied McKeown et al.'s line card in Delvaux's multi-channel communication link. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to use McKeown et al.'s packet-switch system in Delvaux's system and method for combining multiple physical layer transport links with the motivation being received an ATM cell from an external OC-192 line (col. 8 lines 66-67).

Allowable Subject Matter

8. Claim 11 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. Claim 18 is allowed.

The following is an examiner's statement of reasons for allowance:

Regarding claim 18, the prior art fails to teach a combination of the steps of:

for each second direction channel a serializer device connected to receive the cells of the second direction channel and to output the cells as serial data on one or more serial data connections extending through the midplane to the line card;

a second transmit control circuit connected to the serializer devices, the transmit control circuit configured to cause the serializer devices to output the cells in sequence order with the commencement of transmission of cells on different second direction channels staggered in time relative to one another by a time difference T;

a plurality of second deserializer devices at the line card, the deserializer devices connected to receive and deserialize the serial data on the serial data connections; and

a second direction receive control circuit connected to detect an order of arrival of cells on the serial data connections and to place the cells into a received data stream in the order of arrival, in the specific combination as recited in the claim.

Response to Arguments

10. Applicant's arguments with respect to claims 1, 3-12, 14-18, 20-22, and 24-36 have been considered but are moot in view of the new ground(s) of rejection.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Toan D. Nguyen whose telephone number is 571-272-3153. The examiner can normally be reached on M-F (7:00AM-4:30PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Huy Vu can be reached on 571-272-3155. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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